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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/688,337

10/17/2003

Yan Borodovsky

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FISH & RICHARDSON, PC
P.O. BOX 1022
MINNEAPOLIS, MN 55440-1022

EXAMINER

CHACKO DAVIS, DABORAH

ART UNIT	PAPER NUMBER
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1756

MAIL DATE	DELIVERY MODE
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05/16/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/688,337

Applicant(s)

BORODOVSKY, YAN

Examiner

Daborah Chacko-Davis

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 February 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8, 16-28 and 37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8, 16-28 and 37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-5, 7, 16-20, are rejected under 35 U.S.C. 102(b) as being anticipated by U. S. Patent No. 4,517,280 (Okamoto et al., hereinafter referred to as Okamoto).

Okamoto, in col 3, lines 12-54, discloses a method of patterning a substrate by forming a photoresist layer on the substrate, performing a first exposure by holographic exposure (interference lithography) to form an array of repeating line and space patterns (grating pattern, in a first photoresist layer), performing a second exposure via a mask (see figure 3(3)), thereby introducing irregularity (imparting the mask pattern or arbitrary arrangement) into the already formed repeating line and space patterns, i.e., reducing or ending the continuity of the array of the line and space pattern (grating pattern or trench pattern) (claims 1, 4, 16-17). Okamoto, in col 3, lines 25-55, and in figure 3, discloses forming an arbitrary figure (see reference B in figure 3(4), a second photoresist mask formed in a second photoresist layer) above or in some portion of the array of line and space patterns (grating), and etching (patterning) the substrate through portions not covered by the second photoresist mask B (arbitrary figure) using the arbitrary arrangement (directs the etching or selective etching) i.e., reducing the continuity of the array of patterns by cutting spaces in the array and imparting or

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transferring the photomask or resist mask pattern onto the substrate (claims 2-3, 5, 7, 18-20).

3. Claims 1-2, 6, are rejected under 35 U.S.C. 102(b) as being anticipated by U. S. Patent No. 6,337,175 (Yamaguchi).

Yamaguchi, in col 5, lines 24-67, in col 6, lines 1-24, and in figures 2, 3, and 4, discloses a method of patterning a substrate by forming a photoresist layer on the substrate, performing a projection lithographic exposure (using a stepper) on the photoresist layer to form an array of line-and-space patterns, performing a second exposure by forming an arbitrary figure (using a second photomask, reference 5) above the array, thereby introducing an irregularity in the array of the line-and-space patterns and reducing the continuity of the portion of the array (see figure 4, the continuity of the array is reduced as a result of the second exposure using a mask different from that of the first exposure) (claims 1-2, and 6).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 8, and 21, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 4,517,280 (Okamoto et al., hereinafter referred to as Okamoto) in view of EP 0915384 (Sugita et al., hereinafter referred to as Sugita).

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Okamoto is discussed in paragraph no. 3.

The difference between the claims and Okamoto is that Okamoto does not disclose the patterning of the substrate with the arbitrary arrangement uses a pitch yielding a k_1 factor smaller than 0.4 (claim 8). Okamoto does not disclose that the first interference exposure process uses a pitch that yields a k_1 factor approaching 0.25 (claim 21).

Sugita, in col 4, lines 1-41, discloses using a k_1 factor of less than 0.4 and that a k_1 factor as low as 0.25 can be used in an interference exposure process.

Therefore, it would be obvious to a skilled artisan to modify Okamoto by employing the pitch that generates the claimed k_1 factor as suggested by Sugita because Sugita, in col 3, lines 33-56, and in col 4, lines 1-15, discloses that the using the claimed k_1 factor i.e., less than 0.5 in an exposure process enables a higher resolution in the pattern and produces a fine periodic pattern that corresponds to the intensity distribution of the impinged light on the wafer.

6. Claims 22-28, and 37, are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent No. 4,517,280 (Okamoto et al., hereinafter referred to as Okamoto) in view of EP 0915384 (Sugita et al., hereinafter referred to as Sugita).

Okamoto, in col 3, lines 12-54, discloses a method of patterning a substrate by forming a photoresist layer on the substrate, performing a first exposure (first lithographic technique) by holographic exposure (interference lithography) to form an array of repeating line and space patterns (grating pattern, in a first photoresist layer) having a first pitch, performing a second exposure via a mask (see figure 3(3), a second

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lithographic technique), thereby introducing irregularity or imparting a second pattern with a second pitch into the already formed repeating line and space patterns, i.e., reducing or ending the continuity of the array of the line and space pattern (grating pattern, eliminating the impact of some of the line and space pattern portions on the substrate) and wherein the second pitch is more than twice that of the first pitch (see figure 3) (claims 22-24, and 26). Okamoto, in col 3, lines 34-40, and in figure 3 (3), discloses performing a second exposure on the line and space pattern using a binary mask (a mask with part of the mask providing a light shielding section and the remaining part of the mask is a transparent section) so as to eliminate the impact (continuity) of the array of patterns (claim 25). Okamoto, in col 3, lines 25-55, and in figure 3, discloses forming an arbitrary figure (see reference B in figure 3(4), a second photoresist mask) above or in some portion of the array of line and space patterns (grating), and etching (patterning) the substrate through portions not covered by the second photoresist mask B (arbitrary figure) using the arbitrary arrangement (directs the etching or selective etching, transferring a superposition) i.e., ending the continuity of the array of the line and space patterns or eliminating the impact of some portions of the line and space patterns by etching the exposed areas (not covered by the arbitrary figure viz., mask)(claims 27-28, and 37).

The difference between the claims and Okamoto is that Okamoto does not disclose that the first exposure process uses a pitch that yields a k_1 factor smaller than or equal to 0.5. Okamoto does not disclose that the first pitch yields a first k_1 factor

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approaching 0.25. Okamoto does not disclose that the second pitch yields a second k_1 factor greater than 0.5.

Sugita, in col 4, lines 1-15, discloses using a k_1 factor of less than 0.5 in an interference exposure process. Okamoto, in col 4, lines 16-20, discloses that a lithographic process can be performed using a k_1 factor greater than 0.5.

Therefore, it would be obvious to a skilled artisan to modify Okamoto by employing the pitch that generates the claimed k_1 factor as suggested by Sugita because Sugita, in col 3, lines 33-56, and in col 4, lines 1-15, discloses that the using the claimed k_1 factor i.e., at least less than 1.0 in an exposure process enables a higher resolution in the pattern and produces a fine periodic pattern that corresponds to the intensity distribution of the impinged light on the wafer.

Double Patenting

7. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29

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USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

8. Claims 1-3, 6, 16, and 37, are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 11-12, and 37, of copending Application No. 10/681,030 (Yan Borodovsky, USPGPUB 20050074698). Although the conflicting claims are not identical, they are not patentably distinct from each other because claims 11-12, and 37, of the copending Application No. 10/681,030 (Yan Borodovsky) fully encompasses claims 1-3, 6, 16, and 37, of the instant application.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Response to Arguments

9. Applicant's arguments filed February 28, 2007, have been fully considered but they are not persuasive. The 102 and 103 rejections made in the previous office action are maintained.

A) Applicants argue that neither Okamoto nor Yamaguchi teaches introducing irregularity by forming an arbitrary figure in a photoresist above the array.

Okamoto teaches forming an array of patterns using the first photoresist layer, after forming the array, a second photoresist is formed on the array that is patterned with a pitch different from that of the first photoresist pattern (array) and is patterned to form an arbitrary figure on the array, see figures 3(1) through 3(6), and introduces an irregularity to the line and space pattern formed in the first photoresist layer.

Yamaguchi teaches forming a second resist layer (resin layer) on the formed array of first resist pattern, followed by a second exposure via a second photomask, and introduces irregularity to the first resist pattern (array) (see figures 9, 10, and 11).

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within

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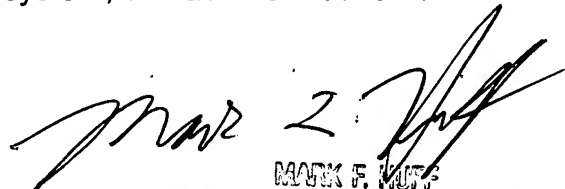
TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daborah Chacko-Davis whose telephone number is (571) 272-1380. The examiner can normally be reached on M-F 9:30 - 6:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F Huff can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

dcd



May 12, 2007.



MARK F. HUFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700